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# LACE

LAYTON ATARI COMPUTER ENTHUSIASTS

LACE is the newsletter of The Layton Atari Computer Enthusiasts and is published monthly. Members are encouraged to submit articles or reviews of Atari software and hardware.

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ANOTHER ARTICLE ?!

by david young

## Homebrew 48/64K 400 upgrade

## " YES , IGOR THE MONSTER IS ALIVE! "

The now famous words as the monster sprang to life in DR. FRANKENSTIEN's labratory on that stormy night. Well, this article is off to a good start, a little grave robbing & brain transplants. Sounds interesting?

Around the end of last year there was a Brain transplant for the ATARI 800XL made available by CLAUS BUCHHOLZ. This memory upgrade was explained in Byte Magazine Sept.'85 and was shortly there after revised to be ATARI 130XE compatable. The upgrade was inexpensive (form $40.00 to $90.00 depending upon how much work you did yourself) & fairly simple for the more experienced hobbist.

I now had a 256k 800XL and some leftover microchips. What to do with the leftovers?? How about upping the memory in my old 400? Good idea I thought. The problem is how! After 4 to 5 months of asking if it was possible to stuff 64k chips in a 400 I got an answer."*Yes, it can be done, I'll look though my old newsletters.*" was the reply from a member of the IMACE group of Ogden.

The following article and diagrams were written by CLAUS BUCHHOLZ ( same guy ) around Sept. 82. and are reprinted from several newsletters but origanally from the "MACE NEWSLETTER" . I did the 48K modification in about 4 hours of watching tv and messing around. I used the 64K chips and the 74LS158 from my XL. The remaining parts I got from Carter supply for about $1.50. I plan on doing the 64K later this month if time permits. So far it runs excellent and has provided me with a second machine for the times when the kids want to compute at the same time I have the XL tied up, in fact the old 400 has run more in the last 3 weeks than it has in the last year and half.

[ NOTE : THE FOLLOWING WILL VOID YOUR WARRANTY ? ]

This modification is not for the fainthearted or clumsy -- one little Oops! and your 400 is DOA.

Nonetheless, we know that among our members there are a few incorrigible hackers who think "Hardwired Spaghetti" improves the machine's asthetic value. As well as some who can't resist a bargain, (used 64K chips can be had for a couple of bucks a set, and 400 ATARIS are very inexpensive.) Altough we don't want to encourge you, we would rather have you down in the basement ripping your computer apart than out on the streets where you might do some real harm. So in the interest of making that OLD 400 useful, public saftey, and a little fun. ---------- the 48/64K 400.



by Claus Buchholz

Reprinted from the "MACE NEWSLETTER", September 1982

None of us needs to be reminded of the awsome power of the ATARI personal computers. What many fail to realize is that, except for the full-stroke keyboard and greater configurability of the '800, the ATARI 400 shares all of the power of her big sister. The high performance/price ratio of the '400 makes it a very attractive computer.

The 16K RAM supplied (8K in earlier models), however, is simply inadequate for many users' needs. ATARI designed the '400 to address 32K but they don't sell 32K boards. Other manufacturers sell 32K and 48K boards, but their added cost severely decreases the performance/price ratio that distinguishes the '400 from other computers.

I have designed and implemented a 48K upgrade for the '400 that you can add for about $70 and a few hours work. With 48K, you can run nearly every program written for the ATARI computers, including that program you've not finished writing because, "It won't fit!"

The modification is based on the idea of replacing the existing 16K-bit (or 8K) RAM chips with the newer 64K-bit devices. These dynamic RAMs are operationally compatable with the 16K chips. Note the two major differences: The 64K RAMs have an additional multiplexed address pin to access the larger memory. Also, they need only a single 5V power supply as opposed to the 5V, 12V and -5V

supplies which the 16K RAMS use (see Figure 1 for a pinout comparison).

Some circuitry must also be added to allow the '400 to address 48K. Note that the new RAM chips can hold 64K of memory, but the ATARI only addresses 48K. If you can't bear to waste the extra 16K, see the suggestions later in the article.

The parts listed in the Parts List are available from many mail order houses who advertise in the back of most computer magazines. You will also need a fine-tipped soldering iron, an ohmmeter, small pliers, screwdrivers, solder, fine wire, and a clean and static-free place to work. You should have a little experience in working with electronics. If you don't find a friend who does and could help you.

The first step is to open your '400. Disconnect all cables. Turn the '400 over and remove the four screws in the underside of the plastic case. While holding the case together, turn it over again. Open the cartridge door and remove any cartridge, leaving the door open. Lift the rear of the top-half of the case over the door. To remove the case top from the keyboard, press on the bottom of the keyboard on either side until it bends, and slide the keyboard away from you. The case top should now be free. Now remove the keyboard by pulling straight up on the flexible connector under the right side of the keyboard.

The circuit board on the right is the power supply. The computer is inside the metal case. Remove the two screws that fasten the left side of the power supply board to the right side of the metal case. Gently, but firmly pull up the left-front side of the power supply to disconnect it from the main board on the bottom. Be careful of the plastic interlock switch plunger when moving the power supply board. Now remove the speaker connector from the left-front of the main board, and lift the metal case out of the plastic bottom.

Turn the metal case over and remove all the screws in the bottom plate. Now pull the main circuit board up and out of the metal case, taking care not to flex the board. You may have to gently pry the edges to loosen the board from the metal case.

You will now see the '400 in it's full splendor. Lay the main circuit board down so the joystick ports face you. The smaller boards sticking up are memory board and CPU board. The one nearer you is the memory board. Unplug each, again being careful not to flex the circuit boards. You may also remove the beige plastic piece on the main board by bending it's prongs underneath the board.

Look at the CPU board. It has three large chips. The middle one is the CTIA or GTIA. If you want to replace your CTIA with a GTIA, now is the time to do it. The CPU board is not altered in this memory upgrade, so put it away.

Look at the memory board. The eight chips along the top are the RAM chips. The other four chips are the addressing circuitry. The edge pin connectors at the bottom are labeled as in Figure 2. If you have an 8K '400, you must alter the memory board before proceeding with the upgrade. Instructions for this modification appear at the end of the article.

The first step in the 48K modification is to eliminate the 12V and -5V sources on the board and move the 5V source to where the 12V used to be. As shown in Figure 3, cut the trace going from pin "X" of the board's edge connector to the capacitor C521. Also cut the trace going from edge pin "Y" to C523. Cut the traces cleanly and completely. Be careful not to slip and damage adjacent traces.

Now remove the capacitors C521 and C523. The trace coming from pin "W" carries 5V. Using a short piece of wire, make a solder bridge between this trace and the old 12V trace, at the point where C523 used to be (see Figure 3). Next, remove the eight capacitors C503, C505, C507, C509, C511, C513, C515 and C517, which are usually in a row along the top of the board.

We now have 5V going to pins 8 and 9 of the RAM chips, and no connection to pin 1. Remove the eight RAM chips and insert the 64K RAMS in their place, properly orienting the notched ends. With an ohmmeter, make sure there is no connection between edge pin "Y" and pin 8 of the chips, nor should there be any connection between any two of the edge pins "W", "X" and "Y".

If all has gone well, the board should be functioning exactly like a 16K memory board, since the addressing circuitry has not been altered. Now may be a good time to test the board (particularly the new RAM chips). If you wish, reassemble the entire computer and check to see if it works properly as a 16K '400. If it doesn't work, recheck all connections and disconnections made so far.

Now take the 5V supply off pin 9 of the RAM chips. To do this, cut the rightmost wide trace on the chip-side of the board (see Figure 4).

Pick up the 74LS158 chip, which is the same as the chips Z503 and Z504 on the memory board. With needlenose pliers, carefully bend up all pins except 1, 8, 15, and 16 (see Figure 5). The remaining four pins are to be soldered to the chip Z503. Remove the chip at Z503 from it's socket and place the 74LS158 on top so that the four pins listed above touch the same four pins on the lower chip (as in Figure 5). Carefully, solder each of the four pairs together, being careful not to get too much solder on the end of each pin.

Now solder a 4" length of wire to each of the pins 2,3 and 4 of the top

chip. Reinsert the chip pair at Z503. Solder the wire from pin 2 into the hole attached to edge pin "M", and the wire from pin 3 to edge pin "U". Next solder the wire from pin 4 to a hole in the former 5V bus, the wide trace along the top of the chip side of the board.

The memory board is now complete. With an ohmmeter, check all connections diagrammed in Figure 6.

The final stage involves modifiying the main (mother) board itself. To help you visualize this stage better, I have included a partial schematic in Figure 7, and a pin diagram in Figure 7a. Locate chip Z103 forward of the memory slot (see Figure 7a). On the underside of the board, cut the traces leading from pins 1 and 2 of Z103. Now attach a wire from pin 24 (across from pin "BB") on the underside of the CPU board slot to pin "U" under the memory slot. Attach a second wire from pin "CC" under the CPU slot to pin "M" under the memory slot.

Now wire the circuit of Figure 7, using the pin diagram of Figure 7a. On the 14-pin socket, solder pins 3 and 4 together with a short piece of bare wire. Do the same with pins 2 and 13. Next solder an 8" length of wire to each of the pins 1, 5, 6, 7, 11, 12 and 14. With these wires, make the six connections to the underside of the cartridge slot as diagrammed. The seventh wire from pin 1 goes to pin 18 on the underside of the memory slot.



Plug the 74LZ02 into the socket and bend the wires around some notches on the edge of the main board, between the crystal and cartridge slot. Finally, solder one of the 680 Ω resistors between pin "A" under the cartridge slot and the nearest ground connection. Be especially careful that excess solder does not form "bridges", making electrical connection where none should exist. Put the second 680 Ω resistor between ground and pin 14 under the cartridge slot.

The modification is finished. Recheck all connections, as an improper connection may damage the computer. Reassemble the computer, being careful that the 74LS02 chip doesn't touch any other circuitry. It's a good idea to wrap the chip in electrical tape.

Plug in the '400 and turn it on. If the blue screen doesn't come up quickly, turn it off immediately and check that your work, including reassembly, has been done correctly. If you have exercised proper care, you should now have 48K of RAM for your '400. Enjoy!

## MODIFYING AN 8K BOARD

Near the center of the board are six pair of holes marked A through F in which two resistors reside. Remove both resistors. If one of them is at C, leave it there. Otherwise, solder one of the removed resistors at C. Now solder a wire

FLASH!! Dave, KD8Z has done this modification and says it works great!!!!

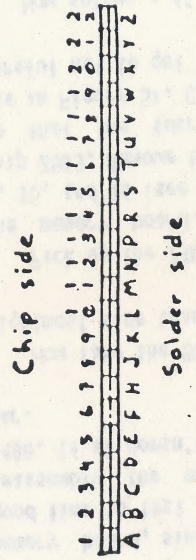



Fig. 2 - Connector identification for memory board, seen from below

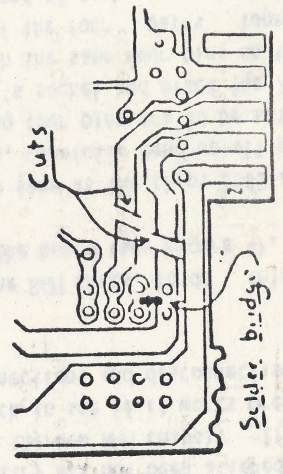



Fig. 3 - Lower left corner of solder side of memory board

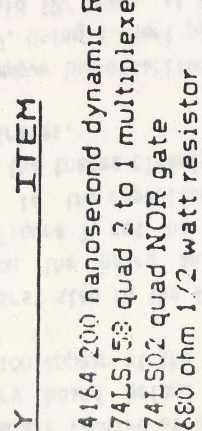



Fig. 1 - Pinout comparison of 64K- and 16K-bit RAMs

PARTS LIST

| QTY | ITEM |
|---|---|
| 8 | 4164 200 nanosecond dynamic RAM |
| 1 | 74LS153 quad 2 to 1 multiplexer |
| 1 | 74LS02 quad NOR gate |
| 2 | 680 ohm 1/2 watt resistor |
| 1 | 14-pin DIP soldertail socket |

from edge connector pin "H" to the trace that connects holes D,E and F together.

Next, cut the trace leading to pin 13 of the chip at Z501, and solder a wire from this pin to edge connector pin "U". The board is now ready to be modified for 48K as described above.

## SUGGESTIONS FOR A 64K MODIFICATION

Figure 8 shows a circuit that will allow you to access the unused 16K on your modified board. After you have successfully completed the 48K modification as described above, disconnect the wire you put between edge pin "U" and pin 3 of the 74LS158. Wire the circuit of Figure 8 in it's place.

Two more chips are needed for this circuit, a 74LS00 quad NAND gate, and a 74LS74 dual flip-flop. They may be wired to the memory board using sockets as you did with the 74LS02. The NOR gate on the left is from the 74LS02 chip you wired to the main board. You may bring it's output to the memory board through an unused edge pin such as pin "V".

The extra 16K is bank switched with the middle 16K of the 48K RAM. By writing a 1 to a memory location between D700 and D7FF (55040 to 55295 decimal), you replace the middle 16K of your 48K with a new bank of 16K. When you write a 0 to the same location, you get the original bank back. This is best done in machine language, since you can confuse BASIC by switching out part of a BASIC program.

Although you must be careful in using this extra 16K, it can come in very handy for storing extra graphics screens or other kinds of data. I have not yet implemented this 64K modification, so I leave it to the more adventuresome of you to build, test and use.

## FINAL NOTES

When a cartridge is inserted into the '400, the addressing circuitry disconnects the top 8K of RAM. For example, with the BASIC cartridge you only have 40K of RAM. This is normally the case with the '800 also. If ATARI ever comes out with a 16K ROM cartridge, it will properly disable the top 16K of RAM when inserted.

Remember, that performing this modification will void any warranty remaining on your '400. If you just can't get the modification to work, you may repair all the cut traces, remove added circuitry, and insert the original RAM chips to restore your '400 to it's original condition, assuming nothing was damaged.



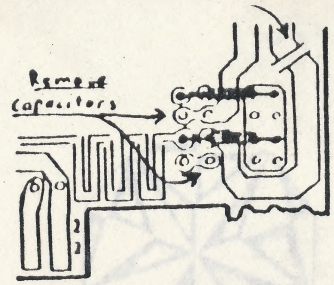



Fig. 4 - Lower right corner of chip side of memory board

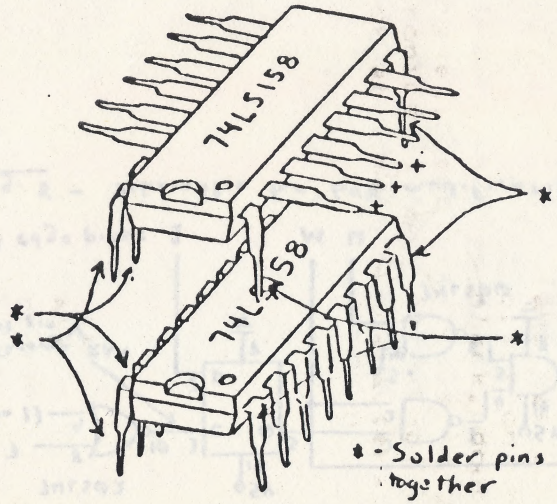



Fig. 5 - Piggyback arrangement

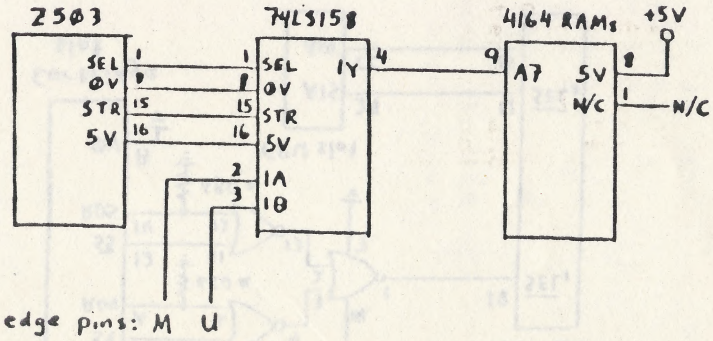



Fig. 6 - Schematic for memory board modification

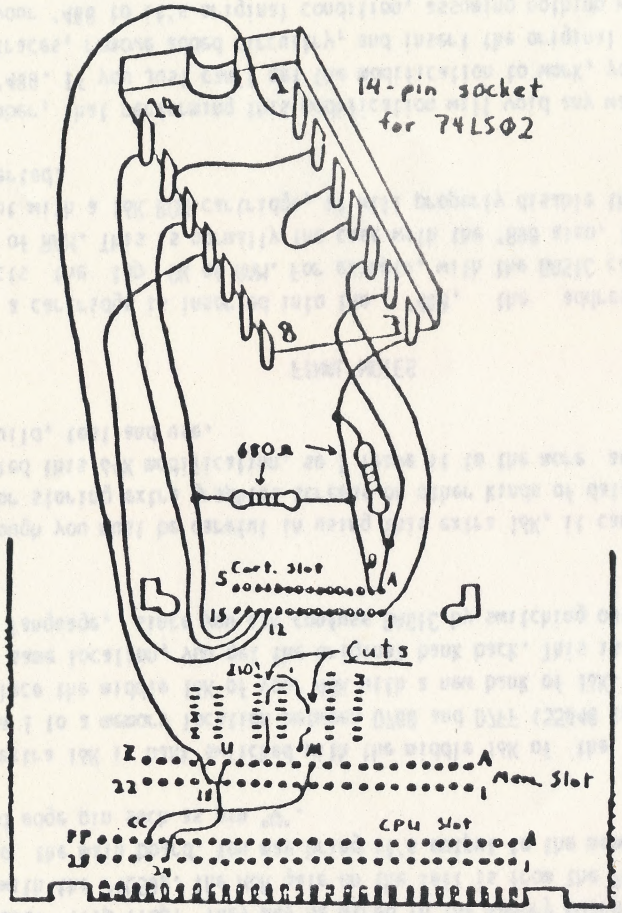



Fig. 7a - Connections for main board modifications

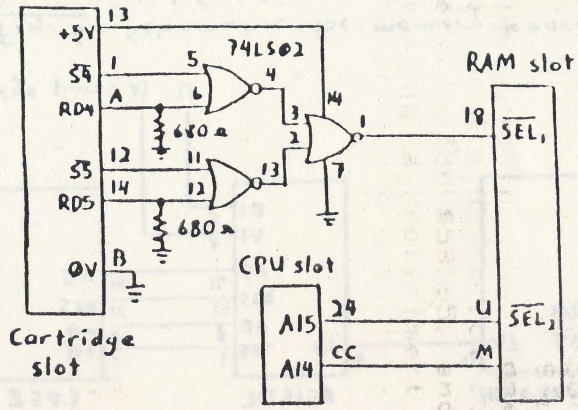



Fig. 7 - Schematic for main board modification

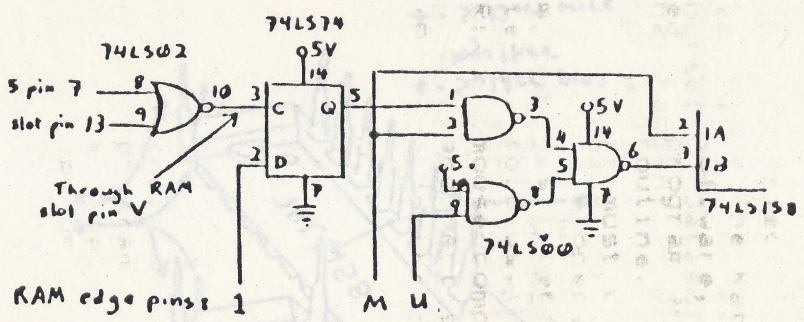
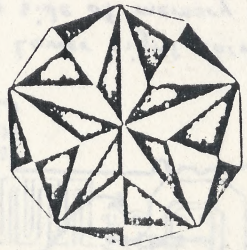



Fig. 8 - Schematic for 64K modification



FLASH!! ATARI has started sending ALL 800s with 48K from the factory at the same price!

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## FINALLY, THE 80-COLUMN CARD
## CES: THE SECOND DAY
BY JACK POWELL

CHICAGO - 6/3/86 -- On the second day of the Consumer Electronics Show, we took a closer look at some of the many computer products filling the basement of McCormick Hall West.

Atari's John Skruch, Manager of XE Software Products, showed us the XEP 80 -- the long-awaited 80-column adapter for the Atari 800, XL/XE computers. The adapter is "new-Atari" gray-colored and just slightly smaller than the old Atari 850 interface. As Skruch said temptingly, "It has the same 'footprint' as the 8-bit 3.5-inch drives."

Atari Corp. is still not ready to announce the long-rumored 3.5-inch drives for the 8-bit line. But reliable sources within the company report that the drives will have a capacity of 325K, formatted, and the Disk Operating System will be compatible with DOS 2.5.

The XEP 80 has a standard Centronics parallel printer port in the back, an RCA monitor input, an I/O cord that plugs into either joystick port and an input for its external power supply (which is about the same size as most modem power supplies).

The card was demonstrated on a standard green monochrome monitor and the letters looked as crisp and clean as an IBM PC screen display. Atari claims the adapter will also work with a color monitor, but not satisfactorily with a television set.

Built-in software supports the entire Atari internal character set, including special graphics characters, plus the Atari international set and an expanded international set contained in the ROM of the XEP 80's controller chip.

The card supports any call which works with the E: device and has such special effects as black on white or white on black, double-width or double-height characters, and blinking or solid cursor and characters.

Skruch said there was a special "burst" mode which printed text to the screen "four times faster" than normal. Although cartridges such as BASIC XE, from OSS, work with the new adapter, most software will have to be specially adapted for it. Also, programs that use bit graphics will have to try something else, since the usual bit graphics screen fills only half the 80-column screen.

The XEP-80 is expected to reach dealers in late fall with a price tag just under $80.

### ATARI PRINTERS

Ever since Atari displayed the first ST a year ago, it has been showing printers. Only now are the dot-matrix graphics peripherals being shipped, at a price of $219.95. The XMM 804 for the ST and XMM 801 XE printer are essentially the same.

The 801 is compatible with the Epson medium-resolution graphics mode and contains a built-in interface for the 8-bit machines. The 804 supports up to 1,280 dots per inch and uses a standard centronics cable to link it with the ST.

Though both machines were designed to be as compatible as possible with Epson printers, they are also fully compatible with the earlier Atari 825 printer and are designed primarily as a new, improved

printer for those who previously owned the 825.

THE ONE MEGABYTE XE

While many companies have jumped on the ST bandwagon, ICD has been quietly churning out important hardware items for the 8-bits, including a straight-connect modem cable for $14.95, a low-cost printer connection for $59.95, and The P:R: Connection, a replacement for the Atari 850 modem interface. The P:R: Connection ($89.95) is a small box with one printer port and two modem ports. It gets its power from the computer and works on any Atari 8-bit machine.

Yes, now you can have a 1-megabyte 130XE. The ICD Multi I/O Board plugs into the parallel bus port and sells for $199 for a 256K version and $349 for a 1-megabyte board.

Included in the board are a parallel printer interface, a serial printer/modem interface, a printer spooler and a hard disk interface. According to ICD, a standard hard disk can be used with either a SASI or SCSI controller card. The product is also compatible with the Supra hard disk.

ICD's display system was configured with two hard disks and one floppy, with built-in software permitting segmenting of the hard disks. The screen displayed four hard disks at 260K, 10Mb, 9Mb and 3Mb, plus three RAMdisks at 192K, 256K and 512K; and finally the one floppy. Oh yes, and a 64K printer spooler.

ICD said that any DOS can be used with the Multi board. The whole thing sounds like a dream come true for 8-bit power freaks.

RATS, AN 8-BIT MOUSE

Matthew Zobian, of Zobian Software, showed us his baby "the Rat", a mouse for the 8-bit Ataris. Zobian feels the mouse is the "wave of the future" in computers and, because the Atari 8-bit is such an excellent graphics machine, it seems perfect for mice --or rats.

The Rat comes with its own software, including a graphics program and a cursor control routine. But Zobian realizes he must court other software developers to make a success of his interface. Accordingly, he told us that MTS is developing mouse-compatible Big Picture and Artist Unleashed -- both graphics packages. RAMbrandt, another paint program, and a business management package by Reeves Software are also being adapted to The Rat.

The single-button Rat is an analog mouse which plugs into the joystick. Zobian claims that it is very easy to program. Without accompanying software, the Rat sells for $89.95.

ANIMATED GRAPHICS FOR ST

Avila Associates, a new company, displayed two new products for the ST at the Atari exhibit area: Make it Move, a graphics presentation utility featuring animation, and Casino Craps, a gambling tutorial. Both are expected in July.

Make it Move lets you grab portions of your DEGAS or NEOchrome pictures and program them into an animated presentation. When we saw it, the program was in the alpha state. Essentially, you can perform functions similar to movie editing techniques, such as wipes, dissolves, fades, cuts and zooms. A single object, grabbed from a screen picture, may be programmed to move along a given path. The same object may also be animated while moving on that path.

Rene De La Brandeis, designer of the program, grabbed a section of a NEOchrome picture and saved it

in a special compressed format. He then pulled it up with the Zoom utility, set its beginning and ending coordinates and ran it. The object appeared from the beginning coordinates and smoothly grew to full size while following a curved path to the end coordinates. It looked good!

Casino Craps displays a very detailed, and accurate, craps board designed to teach the user to play craps at Harrah's casino in Las Vegas. De La Brandeis is currently trying to get Harrah's name on the product. He hopes they'll want to use it to encourage people to learn the game. These days, the only craps players are World War II vets, according to Harrah's. Harrah's, naturally wants to change this, and De La Brandeis hopes they'll use his game to this end. "It's a lot cheaper way to learn craps," he said.

LEATHER GODDESSES OF PHOBOS

Infocom threw a party at Chicago's Field Museum of Natural History to announce some new products -- including a sexy space fantasy. We'll have details tomorrow. Stay tuned.

*"Since we switched to computer systems, J.B. McWilliams here wants to know if we might be able to buy a printer."*

CES - THE THIRD DAY (cont. from Page 10)

packaged with the game. And, yes, you'll have to read the book if you want to succeed with this space challenge.

AND SO, TO BED.

Tomorrow we'll look at an integrated software package for the ST and find out about Penguin's new price drop. They did it before, and it looks like they'll do it again. Stick with us.

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FROM ANTIC ONLINE ON COMPUSERVE

# FIREBIRD DEVELOPS THE PAWN FOR 8-BITS CES - THE THIRD DAY

By Jack Powell
Antic Online

CHICAGO, IL 6/3/86 -- The 800XL and 130XE are back. If the product displays at the Spring Consumer Electronics Show here in Chicago are any indication, more companies are beginning to support these powerful 6502-based graphics computers, partly due to the enthusiasm their 68000-based sibling is receiving.

The Pawn, the successful -- and difficult -- 520 ST graphics/text adventure, is currently being adapted for the 800 XL and 130 XE and will be released in this country through Firebird Licencees.

The Atari 8-bit version of the game will have all the complexity of its ST cousin and the same incredible parser and graphics, but half the graphic resolution. Programmers at Magnetic Scrolls, the technically sophisticated software development group from Great Britain, are playing with the display list to imitate the ST full color spectrum on 8-bit screens.

The new Pawn will also have a postage stamp-size graphic image sitting in the upper-left corner of the screen to give you an idea of where you are. And for hard-core text adventurers who feel graphics are sissy (and rightfully so) a non-graphics mode ignores the 30 pictures stored in the game.

DATASOFT SUPPORTS THE 8-BITS

Datasoft displayed strong 8-bit Atari commitment with a new line of software. Yie Ar Kung-Fu, a Kung Fu game from Japanese firm, Kjonami priced -- like most of Datasoft's 8-bit products -- at $29.95 will be available by Christmas. Fight a succession of increasingly skillful warriors until you finally reach a warrior as good as yourself. Datasoft didn't say what happens if you beat yourself.

221B Baker Street, a Sherlock Holmes graphics/text adventure, can handle up to four players. The game includes 30 different cases on one disk and add-on disks are planned for $14.95 each.

In the underground labyrinth of Mercenary, map and wander the dimensional rooms in this complex 3-D maze game featuring vector graphics. On the planet surface, the game turns into more of a flight simulation arcade game.

Gunslinger is another graphics/text adventure -- this time with a western theme. Never Ending Story, available now, is a graphics/text adventure based on the fantasy movie of the same name.

The Dungeon Module of Alternate Realities is expected to ship in the third quarter. Datasoft also demonstrated a preliminary version of Alternate Realities for the ST which basically scrolled continually around the street maze. No control and no sound, but the graphics were very clean and detailed. They hope to have it out by September. But with Alternate Realities, you never know.

WHAT ABOUT THOSE LEATHER GODDESSES?

Oh yes -- yesterday we mentioned an Infocom party after the show, Sunday night at the Field Museum of Natural History, a Victorian architectural wonder whose interior looks remarkably like several scenes from the movie Dune.

After standing around, drinks in hand, hobnobbing with dinosaur skeletons and stuffed

elephants, the crowd was instructed to proceed downstairs to the "presentation" room.

Leaving this wonderful ambience, we found ourselves in what looked like a small, corporate briefing room, complete with podium and folding chairs. There the programmers responsible for Infocom's newest games described their products.

Steve Meretzky, co-author of the Hitchhiker's Guide to the Galaxy game and author of Planetfall, has come up with The Leather Goddesses of Phobos, a racy spoof of the pulp sci-fi novels of the 1930s, According to Meretzky, it's "the first Infocom game with sex."

There are three levels of play: Tame, Suggestive, and Lewd. Continuing Infocom's policy of highly entertaining -- and piracy-proof -- packaging, Goddesses will include a 3-D comic book (complete with glasses), and an "enticing" scratch & sniff card, which is essential to completing the game.

ANTI-NUCLEAR ADVENTURE IS "ONLY A GAME"

You're an American tourist in London when you suddenly learn that a hydrogen bomb is about to destroy the city.

This is Trinity, a chilling anti-nuclear text adventure.

Written by Brian Moriarty, originally a staff programmer for Analog Magazine and author of Infocom's highly successful Wishbringer, the game places you in historically recreated simulations where nuclear bombs have exploded in the past.

You are given a chance to prevent each one and, if you succeed, eventually work your way back to the first: New Mexico, July 16, 1945. Prevent that and you prevent the whole chain of nuclear history.

This is the first Infocom game to faithfully recreate actual events and locations. It's a bold concept, but Moriarty emphasises it is "only a game."

FEMININE MYSTIQUE

Jim Lawrence, who used to write the Nancy Drew series, and "Witness" programmer Stewart Galley joined forces to create Moonmist. This beginner-level "romantic haunted castle mystery" game is designed to appeal to feminine sensibilities but will, they hope, appeal to both sexes.

NOTED AUTHOR, PROGRAMMER COLLABORATE ON "STARGLIDER"

"Fleet Commander Hermann Kruud sat in a swivel chair in the control room of Starglider One -- the flagship of his invasion fleet -- and stared with brooding, bloodshot eyes at the two sentinel ships that were centered in his hologram field..."

So begins the 70-page novella documenting Star Glider, an ST arcade game currently nearing completion. Programmed by Jez Sans, Starglider is visually similar to Atari Inc.'s coin-operated Star Wars arcade game. Utilizing laser-like vector graphics, you skim over a surface of green dots and anihilate anything coming into your line of sight. The animation is fast and the feeling of flight excellent. Most objects rotate dimensionally and are animated as well.

Not satisfied with just a programmer's input, however, sci-fi author James Follett was hired and practically lived two to three months with the programmer to write a book based on the game. The game was then readapted to fit the book. The full novella will be

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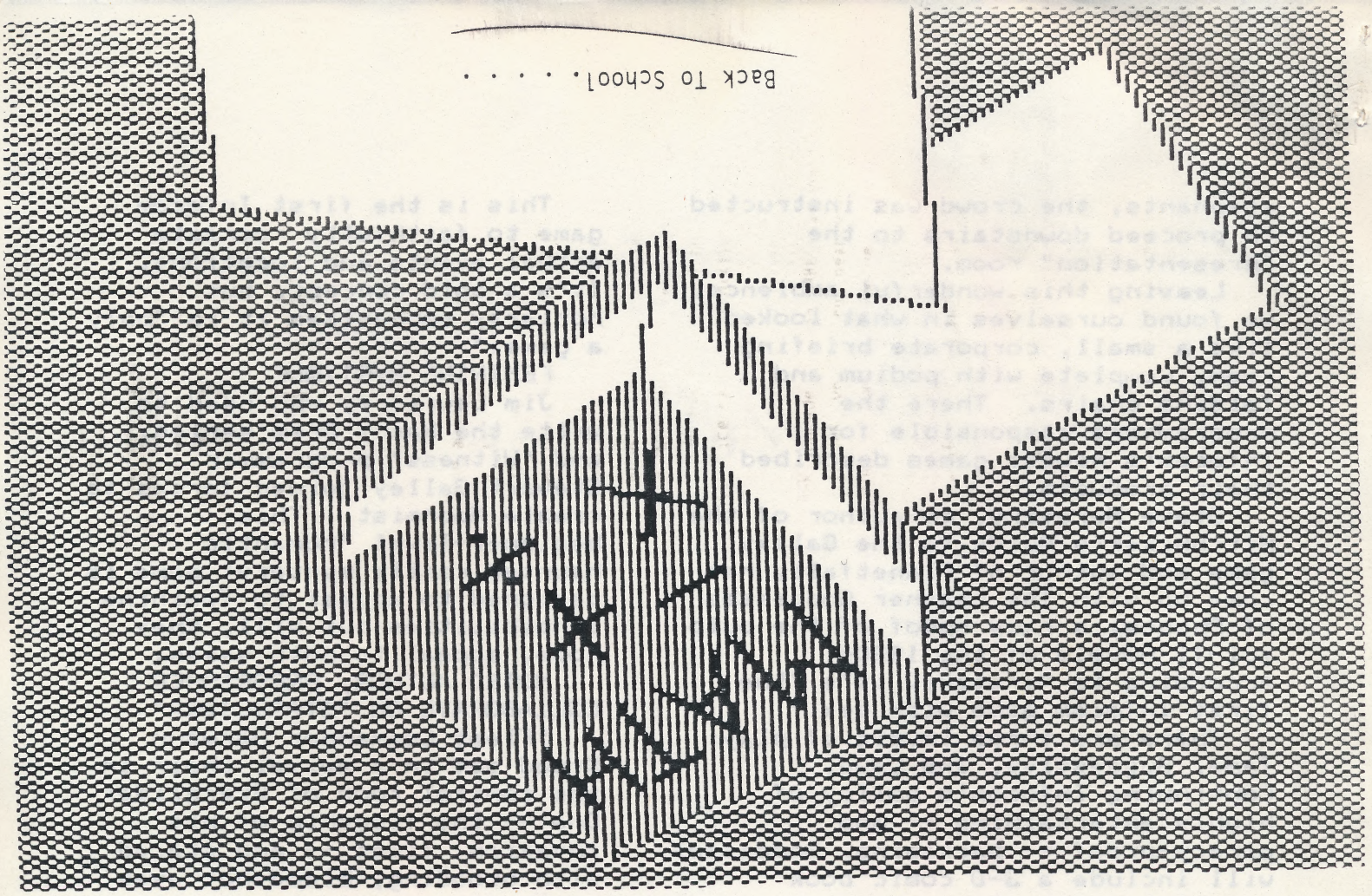


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